

Guidelines of National Licensure Examination for Veterinarians (NLEV)



Veterinary Complex, Tripureshwor, Kathmandu, Nepal

Tel. +977-1-5361210 & 5359144 | Fax +977 1 5359144

Email: info@vcn.gov.np | Website: www.vcn.gov.np

October 2020 (Kartik, 2077)

5.2. Subject wise weightage of NLEV

S.N.	Subject	Distribution of questions items (%)	Total no. of questions
1	Veterinary Medicine	8	8
2	Veterinary Surgery, Radiology & Anesthesiology	8	8
3	Veterinary Theriogenology	8	8
4	Vet. Epidemiology & Public Health	6	6
5	Veterinary Pathology	6	6
6	Veterinary Parasitology	6	6
7	Veterinary Microbiology	6	6
8	Veterinary Pharmacology and Toxicology	6	6
9	Veterinary Physiology	6	6
10	Veterinary Anatomy & Histology	6	6
11	Animal Husbandry (LPM, Nutrition, Forage/Pasture, Breeding, Wildlife, Animal Welfare, APT, Aquaculture)	15	15
12	Social Science (Sociology, Rural Development, Economics, Farm Management, Extension)	6	6
13	Basic Science (Biochemistry, Genetics & Statistics)	6	6
14	Ethics and Jurisprudence	4	4
15	General Knowledge/ I. Q.	3	3
	TOTAL MCQs		100

Note: Details of above course breakdown (syllabus of NLEV) is described in **Annex I**.

5.3. Scoring System

Each correct answer will be evaluated with given 1 mark. There is negative scoring system at the rate of 0.25 marks for each incorrect answer, thus, incorrect answer will lead to mark deduction.

5.4. Passing Standard

The grading system on the NLEV is either pass or fail. No numerical score will be published but all the exam scores will be well documented for internal evaluation as well as legal perspectives.

In order to pass the Licensure examination, the applicant must score at least 40 % marks in aggregate.

5.5. Result of NLEV

The result of NLEV will be published within the same day of the examination. Results will be published at notice board and website of Nepal Veterinary Council.

ANNEX I : SYLLABUS FOR NLEV

Below is the list of topics that will be used for NLEV, as recommended course outline for the examination:

Course Title: Gross Anatomy I (Osteology, Arthrology and Biomechanics)

Osteology: Definition of the terms used in Veterinary Anatomy in general and osteology in particular. Classification, physical properties, chemical composition and structure of bones. Gross study of bones of appendicular and axial skeleton of Ox / Buffalo as type species and comparison with Sheep / Goat, Pig, Horse, Dog and Fowl with particular emphasis on their topography, contour, landmarks and functional anatomy from clinical and production point of view. Detail study of bones of head, neck, thorax, abdomen, pelvis, tail, fore limb and hind limb.

Arthrology: Classification and structure of joints. Articulation and ligaments of head, neck, thorax abdomen, pelvis, tail, fore limb and hind limb of Ox / Buffalo as type species, their structure, functional anatomy and comparison with other domestic animals from clinical and production point of view. Dissection and description of different types of joints of Ox/ Buffalo and their comparison with other species.

Biomechanics: Biomechanics and its application with reference to quadruped locomotion, kinetics of locomotion, stress and strains falling on locomotor apparatus, landmarks, angulation and weight bearing bones of ox, buffalo and comparison with other animals particularly horse and dog. Biomechanics and kinetics of locomotion.

Course Title: Gross Anatomy II (Myology, Neurology, Angiology and Aesthesiology)

Myology: Structural and functional classification of muscles. Gross study of skeletal muscles of head, neck, thorax, abdomen, pelvis, tail, fore limb and hind limb with their origin, insertion and action and their structural and functional importance from clinical and production point of view in Ox / Buffalo as a type species. Dissection of muscles of all body regions of Ox/ Buffalo, their location, functional role in the body and comparison with other species. **Neurology:** Study of central, peripheral and autonomic nervous system. Gross study of meninges, brain, spinal cord, cranial and spinal nerves and their functional importance from clinical and production point of view. Study of brain and spinal cord in different domestic animals. **Angiology:** Gross morphology of heart and disposition of arteries, veins and lymphatic of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb in Ox / Buffalo as type and comparison with that of Sheep / Goat, Pig, Horse, Dog and Fowl. Their importance from clinical and production point of view. Study of heart and major blood vessels in different species of animals. Demonstration of palpable Lymph nodes of the body. **Aesthesiology:** Gross morphological study of the eye, ear, nose, hoof, horn and skin in Ox / Buffalo. Their functional importance and comparative study in other domestic animals. Dissection for study of eye, ear, nose, hoof and horn.

Course Title: General Biochemistry

Scope and importance of biochemistry, structures and functions of cell organelles and biological membranes and transport across membranes. Aqueous system and buffer system, functions of Donnan membrane equilibrium. Dissociation of acids, pH, buffer systems, Henderson-Hasselbalch equation and thermodynamic concept of biological reactions. Biological significance of important monosaccharides (ribose, glucose, fructose, galactose, mannose and amino sugars), disaccharides (maltose, isomaltose, lactose, sucrose & cellobiose), polysaccharides, (starch, dextrans, dextrins, glycogen, cellulose, inulin, chitin), and mucopolysaccharides including bacterial cell wall polysaccharides. Structures and functions

of fatty acids, properties and biological significance of simple, compound and derived lipids and lipoproteins. Structure and functions of prostaglandins and bile acids. Classification, structures, properties and biological significance of proteins and amino acids. Chemical reactions and buffering actions of amino acids. Chemistry of purines, pyrimidines, nucleosides and nucleotides. Biological significance of nucleosides & nucleotides. Structures and functions of deoxyribonucleic acid (DNA) and a typical ribonucleic acid (RNA). Structures and biological functions of water soluble and insoluble vitamins. Classification, kinetics, and inhibition of enzymes. Classification, structure, and functions of animal hormones. Biochemistry of poisoning of snakes and insects. Biochemical techniques (principle and instrumentation of centrifuge, spectrophotometry, chromatography and electrophoresis).

Course Title: Ruminant Production and Management

Introduction, terminology, prominent Exotic and indigenous breeds of cattle, buffalo, sheep and goat. Classification of Indian cattle breeds. Principle and types of housing for ruminant's animal. Care and management of cattle, buffalo, sheep and goat. Artificial raising of calf and orphan lambs/kids. General management such as grooming, dehorning, identification, castration, barn sanitation, milking methods and practices, docking, dipping and drenching judging and selection dairy animal.

Course Title : Principal and Practices of Fodder Production and Pasture Management

Terminology of fodder and pastures. Climate and soil type. Factors affecting chemical composition and nutritive value of folder. Fodder plant growth development and yield morphology of forage grasses. Principle of grass seed production. Cultivation practices of common annual and perennial fodder legumes and grass. Common pasture species and their management. Pasture establishment cultivated seed beds and nutrition of grazing animals. Pasture and soil fertility. Preservation and conservation: hay and silage making. Silvi-pastoral system and its importance.

Course Title: Sociology and Principles of Veterinary and Animal Husbandry Extension

Sociology- the concept and importance of study of sociology for veterinary extension worker, basic concept of sociology and rural sociology as applied to extension education; Principles of extension in relation to animal husbandry; extension teaching methods, communication to innovation; programme planning; livestock marketing extension; sharing and linkage with actors and their relationship to animal husbandry extension.

Course Title : Histology and Embryology

General Histology: Structure of animal cell and basic tissues and their functional activity. Epithelia and their modifications. Connective tissue and its components including blood and bone. Muscular tissue types and their functional peculiarities. Neuron, nerve fibre and ganglion. Comparison of light and electron microscopy. Histological techniques, Processing of tissues for paraffin sectioning and Haematoxylin and Eosin staining. Microscopic examination and identification of basic tissue and their components. Systemic Histology: Study of microscopic structure of the organs of digestive, respiratory, urinary, reproductive, nervous, cardiovascular, endocrine and lymphoid systems, sense organs of domestic animals and birds. Examination of histological sections of various organs/systems of domestic animals and birds. Embryology: Gametogenesis, fertilization, cleavage, gastrulation, and the development of foetal membranes in birds and mammals. Structure and types of mammalian placenta. Development of the organs of digestive, respiratory, urogenital, cardiovascular, nervous and locomotor system and organs of special sense and endocrine glands. Fetal circulation. Study of structure of mammalian ova, spermatozoa and egg of fowl. Study of serial sections of avian and mammalian embryo / foetus at different stages of development.

Course Title: Physiology I (Locomotor, Cardiovascular, Blood & Respiratory System)

Introduction and vocabulary related to physiology. Types of muscle and its contraction. Rigor mortis and fatigue. Composition of muscle, physiological properties of muscle. Blood, blood volume, hemograph, erythrocyte, origin, maturation, fate, hemoglobin and its metabolism, anaemia, leucocytes classification, formation of thrombocytes, blood plasma, composition of plasma protein, coagulation of blood, lymph composition formation and flow, cerebrospinal fluid and synovial fluid. Heart and conduction system, electrocardiogram, cardiac cycle, Heart beat and sound, cardiac output, coronary circulation. Nervous and chemical regulation of heart, cardiac arrhythmias vascular system, blood flow, blood pressure, pulse, vasomotor control, pulmonary circulation, shock. Adaptation during exercise, fluid and electrolyte balance. Respiratory apparatus, mechanism of respiration, types of breathing, volume of air respired, intrapulmonic and intrathoracic pressure, composition of inspired and expired air, gas laws, transport of blood gases, exchange of gases in lungs and tissues, anoxia, regulation of respiration, respiratory reflexes, adaptation of respiration during muscle exercise, role of respiration in acid base mechanism and respiration in birds.

Course Title: Non- ruminant Production (Pig and Poultry)

Importance, constraint, scope and statistics of pig and poultry in Nepal. Prominent breeds of pig and poultry (Local, Exotic; Berkshire, Yorkshire, Hampshire, Duroc Jersey landrace, Tamworth) Housing, feeding and management of pig and poultry. Hatching, Brooding, selection and grading of egg. Selection and culling of Layers. Maintenance of bio-security in a commercial farm.

Course Title: Physiological Biochemistry

Enzymes: Definition and classification, EC numbering of enzymes. Coenzymes, cofactors and iso-enzymes. Properties: Protein nature, enzyme-substrate complex formation, modern concept of the active center of enzyme. Specificity of enzyme action: Substrate specificity, group specificity, stereo or optical specificity. Factors influencing enzyme action: Effects of temperature, pH,

concentration of substrate and enzyme. Enzyme units: International Units, katal, turnover number & specific activity. Enzyme inhibition: Competitive, non-competitive, uncompetitive inhibition & suicidal inhibition. Allosteric enzymes. Biological oxidation: Enzymes and coenzymes involved in oxidation and reduction viz. Oxidoreductases, oxidases, oxygenases, dehydrogenases, hydroperoxidases & cytochromes. Respiratory chain/ electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain. Carbohydrate metabolism: Glycolysis, Krebs's cycle, glyoxylate cycle, HMP shunt, gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, hormonal control of carbohydrate metabolism & regulation of blood sugar Bioenergetics of carbohydrate metabolism. Lipid metabolism: Beta oxidation of fatty acids, ketone body formation, biosyntheses of fatty acids, triacylglycerol, phospholipids & apoprotein metabolism. Bioenergetics of lipid metabolism. Protein metabolism: Biosynthesis and degradation of proteins. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle. Nucleic acids: Metabolism of purines and pyrimidines. Biosynthesis of DNA & RNA. Integration of metabolism. Metabolic functions of macro and micro nutrients, Metabolic functions of lipid and water soluble vitamins. Uses of isotopes in metabolic studies.

Course Title: Principle of Animals Nutrition

Role of Animals nutrition in Animals husbandry and its scope in Nepal .Comparative composition of plant and animals cells and tissues .Feed stuffs and their nutrition content with utilization characteristics functions and classification of carbohydrates, protein, lipid and fats function of water in animals body characterizes and nutritional importance of minerals and vitamins feed additives and their role. Digestion, absorption and metabolism and various nutrients ruminants non ruminants and birds feeding standard in different species and age group of animals.

Course Title: Animal Housing and Sanitation

Housing of Animals: General principle, affecting design and construction of buildings for housing animals and poultry. Site selection, traditional housing, use of local construction materials, conventional housing systems of housing, tail to tail and head to head, advantages and disadvantages. Poultry housing, deep, litter, cage, battery housing. Housing of small ruminants and swine.

Sanitation: Water supply, functions, deficiency symptoms sources, quality and mean of pollution and purification water requirements and supplies. Sanitation and ventilation, diseases associated with water, air and environment costing, site selection design familiarization with different housing water supply and ventilation.

Course Title: Biostatistics and Computer Application

Basic statistics, An overview of statistics- introduction and importance, Frequency distribution, Measures of central tendency & dispersion, Probability & Probability distributions, correlation & Regression, Tests of significance (Z, t, F & χ^2) , Elements of vital statistics – Rate & Ratio- mortality, fertility , incidence & prevalence rates – Standardized rates.

Computer application, Introduction to personal computer, operating system data management and

analysis, use of LAN & other networking statistical computation of different parameters and analysis, Introduction with programming C.

Course Title: Splanchnology and Applied Anatomy

Splanchnology: Gross morphological and topographical study of various organs of digestive, respiratory, urinary, reproductive, lymphatic and endocrine systems, Pleura and Peritoneum in Ox, Buffalo as a type species and their comparison with that of Sheep/Goat, Pig, Horse, Dog and Fowl. Dissection and study of organs of digestive, respiratory, urinary, reproductive, lymphatic and endocrine systems of Ox /Buffalo and their comparative anatomy in other species.

Applied Anatomy: Different Terminology used in applied Anatomy. Palpable Anatomical body structures, peripheral lymph nodes and their use in health and disease. Learning different anatomical methods of approaching different sinuses in life. Applied anatomy of sites for laparotomy, oesophagotomy, rumenotomy, gastrotomy, tracheotomy, cystotomy, urethrotomy, palpation of anatomical structures in the abdominal and perineal regions. Radiographic visualisation of gross anatomical features of various regions of the body.

Course Title: Parasitology I (General Parasitology and Cestode Parasites)

Introduction to parasitology- Parasites and parasitism, Animal association, Types of hosts, Types of parasitism, Host parasite relationship, Mode of transmission of parasites and methods of dissemination of the infective stages of the parasite, Parasite specificity in relation to species, breed, sex and location. Tissue reaction caused by parasite to the host. Resistance of hosts to parasitic infections/infestation. Immunity against parasitic infections. Standardized Nomenclature of Animal Parasitic Diseases (SNOAPAD). General description of helminth parasites affecting domestic animals and birds.

Classification of helminthes, characteristics of phylum (Platyhelminthes, Nematelminthes and Acanthocephala). Salient morphological features of diagnostic importance. Lifecycle of the cestode parasite in relation to transmission, pathogenesis, epidemiology, diagnosis, general control measures of following cestode parasite of animals and birds.

Cestodes: Mesocetoides, Equine tape worms (Anoplocephala, Paranocephala), Ruminant tapeworms (Moniezia, Avitelina, Stilesia), Dog tape worms (Dipylidium, Taenia, Multiceps and Echinococcus), Poultry tape worms (Davainea, Cotugnia, Raillietina, Amoebotaenia), Dwarf tape worm (Hymenolepis nana) and Fish tape worm (Diphylobothrium).

Course Title : Physiology II (Digestive, Excretory and Nervous System)

Prehension of food, mastication, salivation, deglutition and digestion in simple stomach, stomach movement, hunger, digestion in rumen, digestion and absorption in small and large intestine, pancreatic and intestinal secretion. Liver bile and detoxification. Intestinal movement, defecation, nervous control of digestive processes, digestion in poultry. Kidney, urine formation and composition, renal secretion. Skin- Sebaceous gland and their secretion, water loss through sweat and insensible perspiration, regulation of body temperature. Nervous system, neurons, synapses, receptors, all or none character of nerve impulses. Cutaneous receptor organs, peripheral nerves,

spinal cord and reflex action, cerebellum, thalamus, hypothalamus, pons, medulla and spinal cord, cranial and spinal nerve reflexes. Autonomic nervous system. Vision, hearing, taste and smell.

Course Title: General Pathology

Introduction to pathology, Introduction to concepts of disease. Mechanisms of disease caused by viruses, bacteria and other agents. Cellular injury, degeneration and necrosis including mechanisms of cell injury, alteration to cells, the response of cells, Pigments and other tissue deposits, Circulatory and vascular changes including fluid and hemodynamic derangement associated with diseased or inflamed tissues, thrombosis, embolism, infarction, and shock, Inflammatory processes, including acute and chronic inflammation, and their systemic affects, healing and tissue repair, including regeneration, wound healing and modification of the repair response. Immune mechanisms, immune-related diseases. Developmental disturbances. Classification, nomenclature, types, and Immunity against tumor. Structure, appearance, growth, spread, Diagnosis and systemic effect of cancer.

Course Title: Applied Animals Nutrition I [Ruminant]

Digestion, absorption and metabolism of nutrients in ruminants. Evaluation of foods: Digestibility, measureless of digestibility, factors affecting digestibility, system of expressing the energy value of foods. breeding standards: for maintenance and growth, reproduction, milk production, MRC, ARC, and India feeding standard Balance ration a feeding of livestock: Breeding dairy cattle and buffaloes, feeding goats for meat and milk production. Feeding of sheep, Racing cattle and buffaloes for meat production. Feeding ruminants during scarcity periods.

Course Title: Microbiology I (General Veterinary Microbiology)

History, development and concepts of Microbiology with special emphasis on Bacteria. Definition and general properties of Bacteria. Differentiation of prokaryote from eukaryote. Morphology, microscopic and ultramicroscopic structures including their composition and function of Bacteria. Nutrition, cultivation and growth of Bacteria. Physiology and metabolism of Bacteria. Bacterial genetics: Replication of DNA and RNA, plasmid, gene transfer (transformation, conjugation, transduction, F- factor, C-factor and R-factor) mutation and their effects. Pathogenic microorganisms and their relationship to diseases; Mechanisms of infection. Microbial virulence: Factors influencing virulence, Koch's postulate. Toxins: Exotoxin, endotoxin and their effect on host tissues; role of antitoxin against toxins. Sterilization and disinfection: Methods of sterilization, types of disinfectants and their characteristics. Classification of bacteria. History of Virology, definition, general properties of Virus and differentiation of Virus from other Microorganisms. Composition and functions of viral structures, antigenic determinants or epitopes. Physical, chemical and biological properties of Viruses. Nomenclature and classification of Viruses. Viral genetics: Scope, Genetic map and viral genome organization. Inactivation and preservation of Viruses. Purification of Viruses. Replication of Viruses and their effects on host at cellular and multi-cellular level. Molecular Virology: Definition and scope of Molecular Virology. Viral DNA and RNA, PCR, RT-PCR, Gel electrophoresis, Pulse-field gel electrophoresis, Recombinant DNA technology: Cloning and gene expression, Hybridization techniques, SDS-PAGE, Western blotting and Immuno-chemiluminescent assay. Bacteriophage. Epidemiology of Viral Infection. Resistance

to Viral infection and immunity: Interference phenomenon and interferon. Viral vaccines and chemotherapy. Persistent Viral infection and slow Viruses.

Course Title: Bee, Pet Lab Animal Management

Introduction to agriculture and its prospects in Nepal. Common bee races its morphology and anatomy. Management honeybee products and its extraction. Disease, insects and other enemies of honeybees. Introduction importance of pet animals in Nepal. Common breeds pet animals/birds (dogs/cats) Vices of pet animals and their control measures care and management of pet animals. Method of restraining and controlling of dog and cats. Selection of pup, habitat, food and feeding of pets. Common parasites and diseases with their control measures. Importance of laboratory animals. Care and housing standard of lab animals eg. mice, rats and guinea pigs etc. general consideration on feeding and nutritional requirements, important consideration in breeding of lab animals. Prophylactic measures against common disease of lab animals. Hygienic care and control parasites.

Course Title : Principles of Genetics and Animal Breeding

Animal cell, gametogenesis, chromosomal study: Karyotyping chromosomal variation and abbreviation. Mendelian genetics: Experiment principles and extension of Mendelian genetics (Gene action and interaction) linkage, crossing -over, recombination, gene mapping. DNA and its structure, replication, transcription and translation, gene regulation and expression. Population genetics: gene frequency, Hardy and Weinberg law, causes of changing the gene and genotypic frequency and quantitative genetics: phenotypic variation, causes of variations, estimation and concept of heritability and repeatability. Concept of selection and mating system, traits of economic importance of different livestock species, estimation of different genetic parameters.

Course Title: General and Systemic Pharmacology

Historical development branches and scope of Pharmacology, Sources and nature of drugs. Pharmacological terms and definitions. Principles of drug activity: Pharmacokinetics - Routes of drug administration, absorption, distribution, biotransformation and excretion of drugs. Pharmacodynamics- Concept of drug and receptor, dose-response relationship, terms related to drug activity and factors modifying the drug effect and dosage. Fundamentals of drug/screening and assay of drugs. Adverse drug reactions, drug interaction, drug- designing and development, bio prospecting of drugs. Introduction to biopharmaceutics and gene therapy.

Drugs acting on digestive system: Stomachics, antacids and antiulcers, prokinetics, carminatives, antizymotics, emetics, antiemetics, purgatives, antidiarrhoeals, cholergics and cholagogues. Rumen pharmacology.

Drugs acting on Cardiovascular system: cardiac glycosides, antiarrhythmic drugs, vasodilators and antihypertensive agents, haematinics, coagulants and anticoagulants. Drugs acting on respiratory system: Expectorants and antitussives, respiratory stimulants, bronchodilators and mucolytics. Drugs acting on urogenital system: Diuretics, urinary alkalizers, and acidifiers, fluid therapy, ecbolics and tocolytics. Pharmacotherapeutics of hormones and vitamins. Drugs acting on skin and mucous membranes: Emollients, demulcents and counter irritants. Bio-enhancers, Immunostimulants and

immunosuppressants. New drugs and drug formulations.

Course Title : Physiology III (Reproduction, Lactation and Endocrinology)

Endocrine system: general organization and methods of study; Hormones: definition, classification, general mode of action and regulation; Endocrine physiology of hypothalamus, hypophysis, thyroid, parathyroid, adrenal, pancreas, pineal body and thymus glands, local hormones, Interrelation of endocrine and nervous system, interrelation of genetics and endocrinology. Male and female reproductive organs: puberty sexual maturity, role of hormones on sexual development, oestrus, patterns of oestrus cycle in different animals and birds. Oogenesis, follicular development, ovulation, fertilization, pregnancy and physiology of parturition, Functional anatomy of male reproductive organs; Spermatogenesis, Endocrine physiology of testes; thermoregulation of testes, sexual behavior, avian reproduction. Mammary gland: functional organization, structure and development; endocrine control of initiation and maintenance of lactation; colostrum; composition of milk.

Course Title: Parasitology II (Helminthology and Leeches)

General description of trematodes, nematode, acanthocephala, leeches which affected animals and birds. Classification and characteristics of Platyhelminthes, Nematelminthes, Acanthocephala and annelids. Salient morphological features of diagnostic importance, life cycle, mode of transmission, pathogenesis, epidemiology, diagnosis, treatment and control measures of following helminthes of animals and birds.

Trematodes: Liver flukes (Dicrocoelium, Fasciola and Opisthorchis), intestinal flukes (Fasciolopsis), blood flukes (Schistosoma i.e., S. nasalis and other schistosomiasis, and Ornithobilharzia), Amphistomes/immature amphistomiasis (Paramphistomum, Gigantocotyl, Gastrothylax, Cotylophoron, Gastrodiscus, Gastrodiscoides, Pseudodiscus), Lung flukes (Paragonimus) and Oviduct flukes (Prosthogonimus) their importance in the diagnosis.

Nematodes: Ascaris, Parascaris, Toxascaris, Ascaridia, Heterakis and Oxyuris, Bursate Worms (Strongyloides, Strongyles, Chabertia, Syngamus, Oesophagostomum), Kidney worms (Stephanurus, Dioctophyma), Hook worms (Ancylostoma, Agriostomum, Bunostomum, Trichostrongylus, Ostertagia, Cooperia, Nematodirus). Stomach worms (Haemonchus, Mecistocirus), Tissue roundworms (Habronema, Thelazia, Spirocerca, Gongylonema, Gnathostoma), Filarial worm (Dirofilaria, Parafilaria, Onchocerca, Setaria, Stephanofilaria), Lung worms (Dictyocaulus, Mullerius and Protostrongylus), guinea worms (Dracunculus). Spiny headed worms (Acanthocephala and Macracanthorhynchus), Annelids (Hirudinaria and Haemadipsa). International regulations for control of different helminthic diseases.

Course Title: Veterinary Neuroparmacology

Drugs acting on autonomic nervous system: Neurohumoral transmission, adrenoceptors agonists and antagonists, adrenergic- neuron blockers, cholinceptors agonists and antagonists, ganglionic stimulants and blockers.

Autacoids: Histamine and antihistamine agents, 5-Hydroxytryptamine and its antagonists,

prostaglandins, angiotensin and bradykinin.

Drugs acting on central nervous system (CNS): Pharmacology of neurotransmitters, History of general anaesthetics and theories of anaesthesia. Inhalent, intravenous and dissociative anaesthetics; hypnotics and sedatives; tranquilizers, psychotropic drugs, anticonvulsants, opioid analgesic, nonsteroidal anti-inflammatory drugs, analeptics and other CNS stimulants, central muscle relaxants. Drugs acting on somatic nervous system: Local anaesthetics and peripheral muscle relaxants. New drugs and drug formulations.

Course Title: Microbiology II (Veterinary Immunology and Serology)

History and modern concepts of Immunology and Serology. Organs and cells associated with immunity. Definition and types of immunity and resistance. General features and mechanism of immune response. Antigen: Definition, composition, properties, types and functions. Processing of antigen and their relationship with Major Histo-compatibility Complex (MHC) molecules. Response of B and T cell to antigen. Antigen binding sites and their genetics. Antibody: Definition, properties, types and function. Theory of antibody (Ab) production. Antigen-antibody reaction and their consequences. Chemical Mediators of the Immune system. Complement system and their role in immunity. Induction of immune response and immune effector mechanisms. Hypersensitivity and immune tolerance: Different types of hypersensitivity, factors responsible for immune tolerance. Principles of different serological tests: Agglutination test, precipitation test, hemagglutination activity, Hemagglutination-inhibition, Passive hemagglutination tests, Complement fixation test, Fluorescent antibody technique (FAT), Radioimmunoassay, Immunohistochemistry, Enzyme linked immunosorbent assay (ELISA), Immunodiffusion test, Serum neutralization test (SNT), Focus inhibition test (FIT), counter immuno-electrophoresis and Protection test (PT).

Course Title : Systemic Pathology

Pathology of Cardiovascular system, Hemopoietic and immune system, Respiratory system, Digestive System, Urinary system, Genital system, Nervous system, Musculoskeletal system, Sense organs, and Integumentary system with appendages

Course Title : Evaluation of Feed Stuffs

Introduction, scope, importance, history and value of feedstuffs analysis and quality control. Methods, advantages and disadvantages of chemical analysis, chemical composition and nutritive value, anti-nutritional factors, physical and chemical characterization of feeding stuffs, feed additives supplements and adulterants. Specification of feed ingredients and mixed feeds. Factors affecting the storability. In vitro and vivo characterization of feedstuffs.

Course Title : Applied Animals Nutrition II (non- ruminant)

Introduction scope important, nutrient requirements and for feeds poultry (broilers layer, ducks, turkeys, quails, ostrich,). Nutrient requirements and feeding of swine, rabbit and squires feed processing. Compounding of diets for poultry, swine, rabbits and Equine. Preparation and mixing of different types of diets for non-ruminants (poultry, swine, horse, and rabbits), feed additives used in

non-ruminant formulation.

Course Title : Animal Breeding and Biotechnology

Basic molecular biology, isolation, handling radio- labeling of DNA and RNA. Nucleic Acid hybridization, gel electrophoresis and DNA sequencing, restriction and DNA modifying enzyme. The biology of genetic engineering. Cloning selection, screening and analysis of recombinant genetic engineering in action: Analysis of gene structure and function, making proteins, transgenic animals. Molecular breeding approaches for genetic improvement of domestic animals. Recent advances in AI, ET, NT. Manipulation of genetic constitution, gene transformation, transgenic animal production and its role in genetic improvement. Genetic principle of diseases resistance and gene therapy. Animal biotechnology in Nepal and genetic progress achieved through biotechnological approaches in anima.

Course Title: Principles of Aquaculture

Definition and biological characteristics; water quality management; pond management; fish farming systems; fish breeding, nursing and rearing; common fish diseases and parasites.

Course Title: Veterinary Chemotherapy

Antibacterial agents: Classification, general principles in antibacterial chemotherapy, antibacterial resistance. Sulphonamides and their combination with diaminopyrimidines, sulfones, nitrofurans, nalidixic acid and fluoroquinolones.

Antibiotics: Penicillins and cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, macrolides, polypeptides. Miscellaneous agents: methenamine, bacitracin. Rifampin. novobiocin, virginamycin, lincosamides and vancomycin.

Antifungal agents: Topical and systemic agents including anti-fungal antibiotics.

Anthelmintics: Drugs used against cestodes, trematodes, nematodes, drug resistance, broadspectrum anthelmintics. Antiprotozoal agents: Drugs used in trypanosomosis, theileriosis, babesiosis, coccidiosis, amoebiosis, giardiosis and trichomonosis. Ectoparasitocides, Antiviral and anticancer agents. Antiseptics and disinfectants. Growth promoters. Common indigenous drugs of plant origin with proven pharmacological and therapeutic efficacies in various animal ailments. New drugs and drug formulations. Therapeutic drug monitoring.

Course Title: Physiology IV (Growth, Environment and Climatology)

Animal ecology, physiology of growth, regulation of growth, factors affecting efficiency of growth. Clinical effects on growth and production. Physical reaction to environmental changes, physiology of behavior. Climatology- various parameters and their importance; reaction of animal to different environmental variation, viz. temperature and fever; central control of heat regulation. Temperature regulation in birds.

Course Title: Environmental Hygiene

Sources of water supply and their qualities, Physical, chemical, microbiological and biological evaluation of water, Sources of contamination of water and their prevention, Purification and sanitization of water, Sources of air pollution within animal houses and its effect on animal health and production Ventilation and ventilation systems within animal houses and specialized laboratories, Bacteriology of water and air, Disposal of sewage and farm refuses, Health implications of farm wastes, Sanitation and disinfection of animal houses, Methods of prevention and control of air and water borne diseases of man and animals, Atmospheric pollution and methods of control, Farm waste recycling

Course Title: Applied Human Nutrition

Nutrition and human health: Human health needs major Nepalese health problems; Nutritional guides for health promotion, Nutrition guidelines for prevention or health diseases and Cancer, Relation of food and nutrition to health. Food classification, bioactive physiochemical in food saw their mechanism of action to promote human health carboliydrate. Classification, dictory filer and its role, Types of fiber, Physiologic effect of dictor, fiber, dietary fifer recommendation, Special functions of carboliydrate in body tissue, lipid essential fatty acids and its role, types of fat functions of fat in human nutrition and health. Cholesteras and its role in human nutrition,

Proteins : essential and non- essential amino acids, functions of protein, protein requirement , factors affecting protein requirements , protein turnover, functions or dictory protein, measures of protein requirements , vitamins, functions or fat and water soluble vitamins, Dieticiary symptoms, requirements and food sources of vitamins. Minerals: Minerals in human nutrition, major minerals its functions, deficiency symptoms and food sources. trace elements its functions, deficiency symptoms and food sources water, electrolyte and minerals balance, energy metabolism and physical work performance. Nutritional deficiency disorder: Protein energy malnutrition causes of malnutrition. Method to solve malnutrition problem, food facilities: naturally occurred toxicants' in foods chemicals contamination in foods. Foods fortification: principles and applications .Nutrition improvement program in Nepal. Food processing 13lkgs of foods processing on nutrition status.Diet, nutrition and digestive disease (coronary, heart disease, diabetics, mellitus; cancer, gastro-intestinal problem, renal disorders, urolithiasis, food factors and cataract).

Course Title: Microbiology III (Systematic Veterinary Bacteriology and Mycology)

Study of important pathogenic bacteria and fungi in relation to their morphology, isolation, identification, growth, colonial, biochemical, antigenic properties, pathogenicity, resistacne and diagnosis of bacterial and fungal diseases caused by the following genera:

Bacteria: Sphaerophorus, Staphylococcus, Streptococcus, Bacillus, Corynebacterium, Erysipelothrix, Listeria, Clostridium, Filamentous bacteria : Actinomyces, Mycobacterium, Enterobacteriaceae (E.coli, Salmonella, Yersinia, Klebsiella, Shigella and Proteus), Pasturellacea : Pasteurella and Mannheimia, Actinobacillus, Haemophilus, Bordetella, Brucella, Pseudomonas and Burkholderia, Aeromonas, Francisella, Moraxella, and Taylorella, Listeria, Actinomyces, Nocardia, Arcanobacterium and Corynebactehum, Nocardia, Dermatophillus, Spirochaetes : Borrelia,

Brachyspira, Compylobacter, Arcobacter, Helicobacter, Leptospira, Vibrio, Spirillum, Gram negative anaerobes, Rickettsia, Chlamydia, Coxiella, Ehrlichia and Chlamydothelium. Mollicutes: Mycoplasma, Acholeplasmas

Fungi: Dermatophytes, Rhizopus, Sporotrichum, Candida, Mycetozoa fungi, Histoplasma Cryptococcus, Candida, Aspergillus, Zygomycetes, Penicillium and Dimorphic fungi, Fungi causing Mastitis, Abortion and Mycotoxicosis.

Course Title: Parasitology III (Veterinary Entomology and Acarology)

General description of insect and arachnida affecting domestic animals and birds. Arthropoda as direct/indirect parasites. Broad classification, general morphological features, distinguishing characteristics, arthropods as disease transmitters on livestock and poultry. Life cycle and vector potentiality in relation to disease transmission, pathogenesis and control of following arthropods affecting animals, birds and man.

The biting midges (Culicoides), buffalo/black fly, gnats (Simulium), sandflies (Phlebotomus). The mosquitoes (Culex, Anopheles and Aedes). Horse fly (Tabanus), Musca, Stomoxys, Sarcophaga, Warbles (Hypoderma) and bots (Gasterophilus), bugs, lice (Haematopinus, Linognathus, Trichodectes, Damalina, Menopon, Lipeuris, Menacanthus (Poultry lice). Fleas (Pulex, Ctenocephalides, Echidnophaga, Xenopsylla). Arachnids (Ticks and mites of veterinary importance, soft tick (Argasidae), Argas, Ornithodoros and Otobius.

Hard ticks (Boophilus, Hyalomma, Rhipicephalus, Haemophysalis, Amblyomma, Ixodes), mites (Sarcoptes, Psoroptes, Demodex, Chorioptes, Notoedrus). Anti-tick immunoprophylaxis. Damages to hide and skins due to ectoparasitic infestation.

Course Title: Extension Techniques in Veterinary Practices and Livestock Production

Meaning, concept, definition, scope and type of extension teaching, their process, steps and criteria for effective teaching learning. Extension teaching method and their approaches, classification of audio-visual aids, concept of information technologies, multimedia projection and computer aids for extension teaching. Present trend, role issues in agricultural communication. Communication in satellite system, role of private, governmental and non-governmental agencies in agricultural extension development.

Course Title: Special Pathology I

Bacterial disease (general introduction, etiology, pathogenesis, clinical signs, macroscopic and microscopic lesions, sequelae and diagnosis of Tuberculosis, Johne's disease, Actinomycosis and actinobacillosis, Anthrax and black Quarter, Bovine bacillary hemoglobinuria and malignant edema, Brucella and gas gangrene, nocardiosis, campylobacteriosis, Hemophilus, salmonellosis, Tetanus, Enterotoxaemia and Botulism, colibacillosis in swine, CCPP and CBPP, Strangles and Glanders, Brucellosis, Q-fever and ehrlichiosis, Mastitis, porcine enzootic pneumonia, chlamydial group of diseases, Hemorrhagic septicaemia, Leptospirosis and swine erysipelas, Listeriosis, Viral disease-general introduction, etiology, pathogenesis, clinical signs, macroscopic and microscopic lesions, and diagnosis of: FMD, Vesicular stomatitis, and pox, bovine viral diarrhoea and malignant

catarrhal fever, vesicular exanthema, maedi, jaagziekte, scrapie, Rabies, Aujeszkey's disease, bovine and feline spongiform encephalopathies, Canine distemper, canine parvovirus, feline panleukopenia, Infectious canine hepatitis, Hog cholera, diseases caused by rota and corona viruses, infectious bovine rhinotracheitis, , caprine encephalitis-arthritis complex, Rinder pest, PPR and Blue tongue, Equine infectious anemia, equine influenza, equine viral arteritis, African Horse sickness, equine encephalomyelitis and equine rhinopneumonitis, Fungal disease -Introduction, and lesions of: Ring worm, favus, , zygomycosis, histoplasmosis, cryptococcosis and candidiasis, Aspergillosis, aflatoxicosis and degnal disease, ochratoxicosis, trichothecosis and ergototoxicosis. Introduction, etiology, pathogenesis, clinical signs and diagnosis of: fascioliasis, amphistomiasis, ascariasis, strongylosis, hemonchosis, spirocercosis, filariasis, hookworm, tapeworm infections, coccidiosis, toxoplasmosis, babesiosis, Theileriosis, Trypanosomiasis – Surra, Anaplasmosis. Pathological changes in nutritional and metabolic diseases-deficiency/excess of carbohydrates, proteins, fats, minerals and vitamins and in conditions like milk fever, pregnancy toxemia, post-parturient haemoglobinuria, ketosis, hypomagnesemic tetany, azoturia, piglet anaemia and sway back/enzootic ataxia and Rheumatism like syndrome. Pathogenesis, gross and microscopic pathology of heavy metal toxicities like arsenic, copper, lead, mercury, cadmium, strychnine, nitrate/nitrite, hydrocyanic acid (HCN), fluoride, oxalate toxicities and insecticide/pesticide poisoning

Course Title: Abattoir Practices and Animal Product Technology

History, definition, and present situation of abattoir and slaughter slab in Nepal. Handling and care of slaughter animal and birds at lairage. Inspection of slaughter animals and birds. Slaughter procedure and methods of stunning, location and layout of abattoir, slaughter house feature, water supply, ventilation and light. Hygiene practices, abattoir environment impact and mitigation. Roles of local Government and entrepreneur for environment protection. Biosecurity, Fabrication and preservation of meat. Facilities required for health safety and by products utilization.

Course Title: Clinical Biochemistry

Biochemical conditions of health and disease acid-base balance and interpretation. Biochemistry of renal function and acid base balance, digestive disorders, endocrine functions. Liver, kidney and pancreatic function tests. Role of enzymes for detection of tissue /organ affections. Clinical application of enzymes, identification and the basis of treatment of enzyme deficiency, disorders of metabolism with detailed emphasis on diabetes, obesity, atherosclerosis, jaundice, diseases related to hormones. Recent laboratory techniques to assay chemical/biochemicals/immunochemicals and their clinical correlations and interpretation of laboratory results. Enzyme linked immunosorbent assay, agglutination, etc. Toxic metals such as arsenic, lead, antimony, mercury, copper, zinc, fluorides. Nitrates/nitrites, cyanides and tannins in body fluids/tissues of animals and evaluation of toxic residues. Appreciation and differentiation of symptoms caused by various types of toxic materials including agrochemicals plants and drugs. Principle and applications of flame photometer.

Course Title: Veterinary Epidemiology

Definitions and application of epidemiology, ecological concepts of epidemiology, disease spread, patterns of disease distribution, multifactorial causation of disease, strategies of epidemiology, types of epidemiological studies, prevention, eradication and control of diseases, laws regulating animal diseases, international organizations regulating emerging diseases, OIE and its functions, regulations handling, import and export of biomaterials.

Course Title: Parasitology IV (Veterinary Protozoology)

Introduction and general description to protozoa and their development. Differentiate from protophyta, bacteria and rickettsia. Classification of protozoan parasites. Life cycle in relation to mode of transmission, pathogenesis, diagnosis and control of protozoan parasite of veterinary importance.

Entamoeba, Leishmania, Trypanosoma (surra), Giardia, Hexamita, Histomonas, Trichomonas, Balantidium, Eimeria, Isospora, Plasmodium, Babesia (piroplasma), Theileria (theileriosis), Hepatozoon, Toxoplasma, Sarcocystis, Haemoproteus, Leucocytozoon, Besnoitia, Neospora, Cryptosporidiosis and Anaplasma. Recent developments in the preparation of protozoan vaccine for field use. International regulation for control of different protozoan diseases.

Course Title: Microbiology IV (Systematic Veterinary Virology)

Brief history, classification and characteristics of various families of DNA and RNA viruses causing diseases in livestock and poultry, laboratory diagnostic techniques, immunity to viral infections, systemic virology including: DNA viruses: Adenoviridae - Infectious canine hepatitis, egg drop syndrome (EDS), Inclusion body hepatitis-Hydropericardium syndrome (IBH-HPS). Papillomaviridae: Papillomatosis, Poxviridae: Pox viruses of cow, sheep, goat and fowl, Herpesviridae: Aujeszky's disease, malignant catarrhal fever, infectious bovine rhinotracheitis, equine abortion. Marek's disease, infectious laryngotracheitis. Asfarviridae: African swine fever, Parvoviridae: Canine Parvovirus. Circoviridae: Chicken infectious anaemia.

RNA viruses: Reoviridae: African horse sickness and blue tongue, Calf Rotavirus, Birnaviridae: Infectious bursal disease. Picornaviridae: foot and mouth disease (FMD), duck viral hepatitis, Avian Encephalomyelitis Virus. Togaviridae: Swine Fever, Mucosal Diseases, Equine encephalitis, Arteriviridae: equine viral arteritis, Calciviridae: vesicular exanthema Coronaviridae: avian infectious bronchitis, transmissible gastroenteritis, Rhabdoviridae: Rabies, vesicular stomatitis, ephemeral fever. Paramyxoviridae: Rinderpest, PPR, canine distemper and Ranikhet disease. Orthomyxoviridae: Swine, equine and Avian influenza. Filoviridae: Ebola Virus, Arenaviridae: Lassa Virus, Bunyaviridae: Phlebovirus. Flaviviridae: Classical swine fever, bovine viral diarrhoea. Retroviridae: Avian leucosis group, Equine Infectious Anaemia Virus. Hepadnaviridae: Hepatitis B Virus. Lentiviruses- Equine infectious anaemia virus, Sheep pulmonary adenomatosis, Maedi, Visna. Prions: Scrapie (Sheep), Bovine Spongiform Encephalopathy, Mad Cow Disease, Exotic and emerging animal and poultry viruses.

Course Title: Special Pathology II (Poultry, Fish and Diagnostic Pathology)

Biopsy and Cytology, Fish pathology (Anatomy, physiology, immunology and inflammatory response in fish Viral diseases affecting fish bacterial, diseases affecting fish mycotic and parasitic diseases affecting fish Nutritional and toxic pathology Miscellaneous non-infectious diseases associated with physicochemical abnormalities of water. Neoplasia of teleosts.), DNA technology and antibody in disease diagnosis, Tumorigenic disease of poultry- introduction, etiology, pathogenesis clinical signs, post-mortem lesion and microscopic lesion of Marek's disease and Avian leukosis complex. Bacterial disease- introduction, etiology, pathogenesis, clinical signs, PM lesion and diagnosis of: Pullorum disease, typhoid and paratyphoid, Fowl coryza and fowl cholera, Colibacillosis and clostridial diseases (botulism, necrotic enteritis, gangrenous dermatitis, ulcerative enteritis) Mycoplasma gallisepticum infection (chronic respiratory disease), Mycoplasma synoviae infection, Avian chlamydiosis (psittacosis) tuberculosis and spirochaetosis. Viral disease- introduction, etiology, pathogenesis, clinical signs, PM lesion and diagnosis of New castle disease and Infectious bronchitis, ILT, Avian nephritis, infectious stunting syndrome, and reovirus infections, Avian influenza, and Gumboro disease, inclusion body hepatitis, hydro-pericardium syndrome Avian encephalomyelitis, fowl pox, Chicken infectious anemia, EDS-76. Fungal infection- introduction, etiology, pathogenesis and lesions of Aspergillosis, thrush, Favus and mycotoxicosis. Pathogenesis, gross and microscopic pathology of Aflatoxicosis, ochratoxicosis and trichothecenes. Nutritional, metabolic and Miscellaneous diseases- Pathogenesis, gross and microscopic pathology of major diseases due to deficiency/excess of carbohydrates, proteins, minerals and vitamins in poultry. Miscellaneous Diseases: Pathology of important vices and miscellaneous conditions.

Course Title: Theriogenology I (Animal Reproduction and Gynecology)

Introduction, description of pelvic bones and ligaments in domestic animals. Embryology of the female genital tract - development of ovaries and female genital tract. Physiology of reproductive hormones - pituitary, ovarians, placental and other hormones growth, puberty, estrous cycle, sexual maturity in relation to reproduction, role of hormones on various phases of reproduction in females. Symptoms of estrus and estrous cycle in domestic animals. Factors affecting estrous cycle, palpation of genital organs for changes during estrous cycle, coitus, oogenesis, ovulation. Transportation of sperm and ova, fertilization, zygote formation. Shape and location of pregnant uterus. Position and number of foetus in the uterus. Twinning and multiple births in unipara, sex parity, bacterial flora of the pregnant uterus, length of pregnancy. Hormonal control of gestation, duration and rate of reproduction. Abnormalities of fertilization and gestation. Mammary gland and lactation. Period of ovum, embryo, and foetus, organogenesis. Foetal membranes - placenta, umbilical cord. Anomalies of the development. Teratology - inherited and non-inherited anomalies.

Course Title: Internal Medicine I (Systemic)

History and importance of veterinary medicine, Concept of health and disease in relation to general medicine, Definition , classification, etiology, pathogenesis, clinical sign diagnosis, differential diagnosis and treatments of diseases of alimentary tract, respiratory system, cardiovascular system and urogenital system. Diseases of digestive system with special reference to rumen dysfunction

and diseases of stomach in non-ruminants. Affections of peritoneum, liver and pancreas. Diseases of respiratory and cardiovascular systems including blood and blood forming organs. Diseases of uro-genital system & lymphatic system.

Course Title: Veterinary Clinical Service I

Handling of cases brought at veterinary teaching hospital, clinical examination of animals, collection and preparation of samples for laboratory analysis, prescription writing, drug administration and preparation of clinical records.

Course Title: Veterinary Toxicology

General Toxicology: Definitions, fundamentals and scope of toxicology. Sources and mode of action of poisons. Factors modifying toxicity. General approaches to diagnosis and treatment of poisoning. Toxicity caused by metal and non-metals: Arsenic, lead, mercury, copper, selenium, molybdenum, phosphorus, nitrates and nitrites, common salt and fluoride.

Toxicity caused by plants and weeds: Cyanogenetic plants, abrus, lantana, ipomoea, nerium, datura, nux vomica, castor, selenium containing plants oxalate producing plants, plants causing thiamine deficiency. Drug toxicity and toxicity caused by agrochemicals: organophosphates, carbamates, chlorinated hydrocarbons, pyrethroids. herbicides, fungicides, rodenticides and urea.

Residue toxicology: Hazards of residues, concepts of withdrawal time and MRLs, minimizing drug and toxic residues in animal products Venomous bites and stings: Snake bite, scorpion, spider, wasp stings and toad poisoning. Radiation hazards and industrial toxicants. Toxicity caused by food additives and preservatives.

Course Title: Farm Management and Production Economics

Definition, nature, scope and importance of farm management in relation to other sciences. Farm resource management- land, labour, machinery and civil works. Farm management problems in Nepal. Production relationship- factor-product, factor-factor and product-product relationships. Principles of farm management decisions- principle of variable proportion, cost principle, factors substitution, equi-marginal return, opportunity cost, principles of comparative advantages, the principle of time comparison. Farm planning and budgeting. Farm record and account. Farm efficiency measure. Risk and uncertainty management. Linear programming: concept and approach.

Course Title: Theriogenology II (Gynecology and Obstetrics)

Pregnancy diagnosis (PO) in cow - external, internal, clinical, hormonal, ultrasonic, radiographic and differential diagnosis of pregnancy. Mare- rectal and vaginal examination. Biological tests. PD in Ewe, Sow, Bitch and Queen. Disease and accidents during gestation period- prolonged gestation, premature birth, early embryonic death, abortion in cattle, horse, sheep, goat, swine, cat and dog. Mummification of foetus, fetal maceration, induced abortion, extra uterine pregnancy, dropsy of fetal membranes and foetus, abdominal hernias. Torsion of uterus, vagina cervical prolapse, paraplegia of pregnancy. Accidents during pregnancy. Parturition - symptom and initiation of parturition. Stages of parturition. Involution of uterus.

Artificial interferences of normal parturition. Case and diseases of new born and dam. Eutocia, Dystocia, types, causes, handlings of dystocia - diagnosis and treatments of dystocia.

Course Title: Anaesthesiology

History and terminology of anaesthesia, general considerations in selection of anaesthesia, preanaesthetic medication, local and regional anaesthesia, general anaesthesia, balance anaesthesia and stage of anaesthesia, muscle relaxants, electro-anaesthesia, acupuncture and hypothermia, anaesthetic complications, emergencies and their remedies, anaesthesia of laboratory animals and birds, restraining of zoo and wild animals and euthanasia.

Course Title: General Surgery

Introduction, branches, history and development of veterinary surgery, reasons of surgery, principles of tissue handling and general surgical principles, proficiency in veterinary surgery, sterilizations of surgical materials and instruments, suture and ligature, nutritional support to surgical patients, infection control, wound and wound healing, haemorrhage, haemostasis and shock, surgical management of necrosis, gangrene, burn, scalds, frost bite, sinus and fistula, bandages and physical therapy, principles of fluid and blood transfusions, affections and surgical managements of blood vessels, lymphatics, bursa, muscles and nerves.

Course Title: Internal Medicine II (Metabolic and Deficiency)

Definition, classification, etiology, pathogenesis, clinical sign diagnosis, differential diagnosis and treatments of milk fever, downer's cow syndrome, hypomagnesaemia in cattle and buffalo, azoturia in equines, hypothyroidism and diabetes in dogs. Diagnosis and management of diseases caused by deficiency of iron, copper, cobalt zinc, manganese, selenium, calcium, phosphorus, magnesium, vitamin A, D, E, B. complex, K and C in domestic animals and poultry, Nutritional haemoglobinuria. Diseases of neonates. Diseases of skin and musculo-skeletal system, sense organs of domestic animals.

Course Title: Preventive Medicine I (Bacterial, Fungal and Rickettsial Diseases)

Principles of epidemiology, general epidemiology of infectious diseases, Modes of disease transmission. Definition, incidence, etiology, epidemiology, pathogenesis, transmission, clinical signs, diagnosis, treatment, prevention and control of Pasteurellosis, Black quarter, Tetanus, Anthrax, Tuberculosis, Paratuberculosis, Actinomycosis, Actinobacillosis, Brucellosis, Listeriosis, Leptospirosis, Mastitis, Contagious bovine pleuropneumonia (CBPP), Campylobacteriasis (Vibriosis) Chlamydiosis, Botulism, Contagious Caprine Pleuropneumonia (CCPP), Foot rot, Strangles, Glanders, Swine Erysipelas, Salmonellosis, Mycoplasmosis, Fowl Typhoid, Fowl cholera, Colibacillosis, Aspergillosis, Mycotoxicosis, Sporotrichosis, Ringworm, Degenerative disease, Q fever, Anaplasmosis.

Course Title: Veterinary Clinical Service II

Handling of cases brought at veterinary teaching hospital, clinical examination of animals, collection and preparation of samples for laboratory analysis, prescription writing, drug

administration and preparation of clinical records and ambulatory clinics.

Course Title: Fish Diseases

Introduction: principles and importance of fish health management; Common fish diseases: causes, symptoms and treatment; Different methods of disease control: Prophylactic measures and Curative measures; Bio-security and best management practices; Common drugs, chemicals, probiotics and their application.

Course Title: Milk and Milk Product Technology

Milk: definition of milk and diagrammatical representation of milk constituents Composition of milk. Factors affecting the composition, nutritive values and physical and chemical properties of milk, Processing of milk. Different dairy products, Method of preparation, types, and nutritive value of following dairy product: butter, ice-cream, cheese, powder milk and condense milk, sweets, prepared from chhenna and khoa and their quality control.

Course Title: Milk and Meat Hygiene, Food Safety and Public Health

Milk hygiene in relation to public health. Microbial flora of milk and milk products. Sources of milk contamination during collection and transport of milk and processing of dairy products. Control of milk and milk product contamination. Hygienic handling/ management of dairy equipment. Quality control of milk and milk products. Legislation and standards for milk and milk products. Milk as a source of disease transmission. Pathological conditions associated with the transport of food animals. Elements of meat inspection. Hygiene in abattoirs. Ante-mortem inspection of meat animals. Humane slaughter of animals. Postmortem inspection of meat animals. Methods of inspection of meat. Rigor mortis and examination of lymph nodes. Speciation of meat. Health implications of emergency and causality slaughter. Hygienic disposal of unsound meat. Inspection of poultry and aquatic foods (fish) for human consumption. Occupational health hazards in meat processing plants. Meat as a source of disease transmission. Food safety, definition, hazard analysis and critical control point (HACCP) system and chemical and microbial toxicities associated with milk, meat and aquatic foods. Risk analysis: assessment and management and food safety measures. Toxic residues (pesticides, antibiotics, metals and hormones) and microbial toxins in food and their health hazards. Types of bio-hazards. Sanitary and phytosanitary measures in relation to foods of animal origin and aquatic foods. International and national food safety standards, Office International des Epizootics (OIE), World Trade Organization (WTO), Sanitary and Phytosanitary (SPS) and Codex Alimentarius.

Course Title: Meat, Meat Products Technology

Definition, prospects and problems of meat industry in Nepal. Pre-slaughter care and handling effect on meat quality. Structure and growth of muscles, chemical and biochemical constitution of muscles. Conversion of muscle to meat. Eating quality of meat, methods of preservation and maintenance of quality. Edible and inedible carcass and their utilization and handling. Microbiology, deterioration and contamination of meat. Comminuted and emulsified meat product common of in Nepal. Curing methods and ingredients.

Course Title: Theriogenology III (Gynecology and Obstetrics)

Fertility, infertility, anoestrous, hypoplasia, adrenal virilism, genital diseases and infertility of cow, mare, sow, doe, bitch. Infectious diseases- trichomoniasis, vibriosis, brucellosis, granular venereal diseases, pustular vulvo vaginitis, miscellaneous (Infection of bovine female genital tract). Hormonal disturbances - resulting in infertility - cysts, cystic ovaries, anoestrous and its causes, repeat breeding and managemental problems. Obstetrical operation for relieving dystocia, mutation, forced extraction, embryotomy/fetotomy, caesarean section/hysterectomy. Injuries and disease of puerperal period, post-partum haemorrhage, laceration, contusion of the birth canal and adjustment structures, rupture of the uterus, perineum, vagina, prolapse vaginal and uterine prolapse. Abdominal or pelvic visceral prolapse, metabolic diseases of post-partum period, post-partum infections and diseases, retention of placenta and septic metritis, infection of cervix, vagina and vulva. Post-partum paraplegia milk fever, clinical uses of hormones and prostaglandins.

Course Title: Radiology and Diagnostic Imaging

Introduction and historical backgrounds of veterinary radiology, production and properties of X-rays, working principles of x-rays machine and radiographic accessories, processing of radiograph, factors influencing production of radiographs, intensifying screen and its uses, advantages and disadvantages of fluoroscopy, contrast radiography, interpretation X-rays films, biological effect of radiation hazards and safety measures, principles of ultrasonography, CT scan, MRI, echocardiography, scintigraphy, gamma camera, xeroradiography and Doppler and their applications in veterinary practice, physical therapy

Course Title: Regional and Clinical Surgery I

Bone as a tissue, fracture-fracture healing, fracture reduction and fixations, differentiation between fracture and dislocation, affections of the joints, ligaments and tendons, affections of the vertebral columns including contusion fracture of the ribs, injuries to the costal cartilage, Lameness- it's definition and classification, body confirmation in relation to lameness and diagnosis of lameness, affections of the fore and hind limbs and their treatments on different domestic animals, anatomy of the foot, examination of the foot and their treatments, declawing, therapeutic shoes and corrective shoeing, crural paralysis, subluxation of sacro-iliac ligaments, rupture of round ligament, trochanteric bursitis, femoral nerve paralysis, upward luxation of patella and stringhalt, examination of eye and diagnosis of eye diseases, principles of ophthalmic surgery, affections of the eye and their surgical management: entropion, ectropion, growth and tumors of the eyelid, occlusion of the nasolacrimal duct, squint, affections of the cornea and conjunctiva and their management, hydrophthalmia, glaucoma, panophthalmia, injuries and affections of the anterior and posterior chambers, worm in the eye, affections and surgical management of ear, guttural pouches, lips and chicks, teeth, tongue, salivary gland, palate, nose, horns, neck and withers, esophagus, trachea, larynx and pharynx.

Course Title: Preventive Medicine II (Viral, Protozoal and Parasitic Diseases)

Definition, incidence, etiology, transmission, pathogenesis, clinical signs, diagnosis, treatment, prevention and control of Rabies, Pseudorabies, FMD Infectious bovine Rinderpest rhinotracheitis,

Bovine viral diarrhea, Bovine malignant catarrh, Ephemeral fever, Pox disease, Scrapie, Blue tongue, Contagious pustular dermatitis, PPR, African horse sickness, Infectious equine anaemia, Infectious equine rhinopneumonitis, Equine influenza, Virus encephalomyelitis of horse, Hog cholera, Swine influenza, Swine vesicular disease, Canine distemper, Infectious canine hepatitis, Canine Parvo virus infections, Avian influenza, Ranikhet disease, Infectious bursal disease, Infectious bronchitis, Marek's disease, Avian leucosis complex, Fowl pox, Litchi disease, EDS – 76, Avian encephalomyelitis, Trypanosomosis, Theileriosis, Babesiosis, Coccidiosis, Amphistomiosis, Fascioliosis, Schistosomosis, Echinococcosis, Cysticercosis, Trichomonosis.

Course Title: Ethics and Jurisprudence

Legal duties of veterinarians, animal legislation, welfare and forensic laws. Examination of animals for soundness. Examination of injuries causes of sudden animal death. Post- mortem examination. Detection of frauds, malicious poisoning, bestiality, mischief, cruelty, poisoning drugs. Animal quarantine and meat inspection act. Insurance. Ethics for veterinarian made under Nepal Veterinary Council Act. OIE codex.

Course Title: Veterinary Clinical Service III

Handling of cases brought at veterinary teaching hospital, clinical examination of animals, collection and preparation of samples for laboratory analysis, prescription writing, drug administration and preparation of clinical records and ambulatory clinics

Course Title: Molecular Biology and Biotechnology

Structure and properties of nucleic acids, Recombinant DNA technology, Biotechnological application in animal improvements, Nutritional biotechnology, Animal tissue culture, Molecular diagnosis, Fermentation process, regulatory issues in biotechnology and Bio-informatics and modern vaccine. Genetic diseases & Gene therapy.

Course Title: Agriculture Marketing and Cooperatives

Concept and definition – Market and marketing, importance of agricultural product prices and marketing of both inputs and outputs. Meaning and concept of utility, consumers behavior, consumer and market equilibrium, revealed preference, consumer surplus, demand for agricultural products and their derivation. Supply of agricultural products and their derivation. Price, income and cross elasticity of demand and supply, relationship among elasticity and their use. Life cycle and development of products, marketing strategy, market and product promotions. Market structures, price determination and equilibrium in pure competition, monopoly, and oligopoly; Price discrimination. Marketing functions, marketing channels and costs. Marketing margins and price spreads. Spatial and temporal price variation. Marketing research, Marketing efficiency and its measurement, economic models for price analysis. Government intervention and public institutions in marketing, Cooperatives- concept, history, definitions, role, organization, structure, cooperative law and by laws, developing agriculture cooperatives, cooperative marketing, cooperative farming, strength and opportunities.

Course Title: Zoonosis and Public Health

Definition of zoonoses, classification of zoonoses, role of domesticated pets and wild animals, transmission of zoonotic disease, study of important zoonotic disease of the region, method of prevention, control and eradication of zoonotic disease, socio-economic condition and human health

Course Title: Livestock and Poultry Breeding

Concept of heritability and repeatability, Breeding values, dominance and epistemic values. Variance and different gene action. Inbreeding, coefficient of inbreeding and relationship, measure of inbreeding and relationship, resemblance among relatives, inbreeding methods for development of breed, strain, lines and family. Different mating systems crossing in the light of cattle, buffalo, sheep, goat, pig and poultry. Lab animals their breeding, handling and uses. Selection, selection parameters, principles, method, basis and genetic effect of selection. Effective selection procedure for genetic improvement of cattle, buffalo, goats, sheep, pig and poultry. Inheritance of morphological, economic, polymorphic, threshold and sex-linked traits in poultry. Breeding plan for meat and egg production in poultry for hilly region of Nepal. Formation and maintenance of control population of poultry. Selection criteria breeding for chicken meat and egg production. The disease resistance mechanism in poultry. Inbred lines are developed and maintained in poultry. Utilize dw (dwarf gene) for broiler production. Intra population selection schemes in poultry. The Egg production characters of laying poultry. Diallel crossing. Random sample test and is important in poultry research. The effect of dwarf gene on economic performance of poultry.

Course Title: Theriogenology IV (Veterinary Andrology and Reproductive Techniques)

Introduction, development, comparative study of male genitalia and gonads, growth, puberty, sexual maturity, behavior, libido. Factors affecting libido. Forms of male infertility, factors affecting infertility in males, diagnosis and treatment. Abnormalities, malformations, disease of male genitalia and coital injuries, their diagnosis and treatments. Training and Maintenance of Bulls – prepare samples, sterilization of equipment - metals, glass, rubber equipment, -assembling of A.V., Examination of reproductive functions, semen-collection evaluation, dilution, preservation, and Artificial Inseminations, estrus synchronization, superovulation, conceptus and application of E.T. Techniques and cloning.

Course Title: Regional and Clinical Surgery-II

Surgical approaches to the thorax, general considerations for thoracic surgery, major affections of thoracic cavity and their management, Hernia- Classification, etiology, diagnosis, and treatment in various species, affections and surgical managements of- Simple and Compound Stomach, Intestine, anal glands, liver, spleen and pancreas, affections and corrections of urogenital system, castration in various species, scrotal ablation, ovariohysterectomy in various species, their indications, techniques and complications, caesarian section in domestic animals, affections of udder and teat and their surgical management.

Course Title: Animal Welfare

Discussion on concepts and importance of animal welfare, spectrum of animal welfare, five freedoms of animal welfare, ethical concerns of welfare, normal behaviors of animals, Identified behavioral indicators of welfare, interaction of humans with animals, animal-human abuse link, role of the veterinarian in animal welfare, responsible pet ownership, welfare issues in population control programmes, humane methods of euthanasia, cultural differences with respect to philosophy and practices on animal ownership and use, animal welfare for wildlife and animal under disasters management, discussion on concepts in animal welfare including practice governing animal control as well as protection and prevention of cruelty to domestic and wild animals.

Course Title: Veterinary Clinical Service IV

Handling of cases brought at veterinary teaching hospital, clinical examination of animals, collection and preparation of samples for laboratory analysis, prescription writing, drug administration and preparation of clinical records and ambulatory clinics

Course Title: Wildlife, Pet and Lab Animal Medicine

Basic principles of habitat and housing of various classes of wild and zoo animals. Population dynamics of wild animals, Nutrient requirements of wild animals, Restrain, capture, handling, physical examination and transport of wild and zoo animals. Principles of anaesthesia, anaesthetics, chemicals of restraining, Capture myopathy. Principles of zoo hygiene, public health problems arising from zoos. Prevention, control and treatment of infectious, parasitic, nutritional and metabolic diseases in zoo and wild animals. National and international organizations and institutions interlinked to wild and zoo animals, Common diseases affecting dogs and cats (bacterial, viral, parasitic, fungal, nutritional etc.) - their clinical manifestations, diagnosis, treatment and control. Vaccination/ deworming schedules. Common diseases affecting pet birds their control and prevention. Common diseases affecting lab animals, their control and prevention.

Course Title: Social Mobilization and Community Development

Meaning and concepts of development, rural development, community development and the transition in thoughts and application of these aspects developmental process over the period of time to current stage in their historical perspectives. Rural poverty, causes and consequences, and efforts made in the past and present strategies, introductory concepts of and recent experiences in poverty reduction programs through various models and processes of social mobilization and participatory program planning at the grassroots level, preparing portfolio of opportunities and investment plans; implementation of plans; participatory monitoring and evaluation; an overview of gender concepts overtime, issues, and strategies in developmental activities, gender sensitive development planning.

Course Title: Wildlife Production and Management

Taxonomy of wild animals. Future and present status of wildlife conservation and management in Nepal, wildlife law enforcement. Distribution habitats and housing of various class of wild animals. Care of wild animals feeding habits, feeds and feeding system of wild animals. Methods of

restraint, capture, handling and physical examination of wild animals .National park, reserves and other protected areas in Nepal. International organizations concerning wildlife conservation Common diseases and control strategies against it.

Course Title: Veterinarian in Society

Man, Animal and society: Social – ecological interactions in animal rearing. Client oriented approach to physical examination of animals. Concepts in interaction with animal owner / clients. Bio-medical ethics and clinical evaluation. Communication skills. Animal / owner information management. Human – animal bonds. Health maintenance in individual animal and population. Veterinary public health as component of society. Professional development. Societal responsibilities of veterinarians. Societal responsibilities with respect to private and public hospital and practice management. Social conduct and personality profiles in management of clinical practice. Veterinary professional interactions with Health authorities, drug and food regulatory authorities, zoo / animal welfare organizations and civil administration. Role of veterinarian in Natural calamities and disaster management.

Internship

- (a) The compulsory rotating internship for six calendar months shall be done in teaching and approved Veterinary Polyclinics/Veterinary Hospitals, Veterinary Biological Centers, Farms and Veterinary Disease Investigation Centers. The internship program can be undertaken at approved veterinary institutions in Nepal.
- (b) The compulsory rotating internship shall be in the following areas:
 - (i) Clinical training covering veterinary medicine, surgery and radiology, animal reproduction, gynaecology and obstetrics, clinical emergencies, indoor ward care, hospital management record keeping etc. for three months.
 - (ii) Livestock production and management training, covering farm routines of cattle and buffalo farms, piggery/rabbitary, sheep and goat farms, and equine/ camel unit etc. for one month.
 - (iii) Poultry production and management covering layer and broiler production, hatchery and chick management quail, turkey, duck units etc. as well as fishery or any other recycling unit where feasible, for one month.
 - (iv) Livestock technology and service' covering familiarization in biological product units, disease control campaigns (disease investigation and sample collection and dispatch, vaccination, mass testing etc.) in plant training in meat plants, milk plants, etc. training in zoo/ wild life center/ national parks, for one month.
 - (v) Shares the emergency and night duties on rotation in the larger and small' animal hospitals including Sundays & holidays.
 - (vi) Participation with staff of the place of posting in Veterinary Practice (production or technology).
 - (vii) The intern responsibilities include hands-on diagnostic and treatment procedures for hospitalized cases under the supervision of the attending veterinarian.

In addition to above curriculum, NLEV will cover below topics as ‘day old competency’ focus.

Tracking Programs:

- i) Feline Medicine
- ii) Cryobiology of Gametes
- iii) Neurosciences
- iv) Clinical/ Interventional Nutrition
- v) Dermatology/integument Science
- vi) Alternate Veterinary Medicine
- vii) Ophthalmology
- viii) Anesthesiology
- ix) Small Animal Critical Care
- x) Non-Mammalian Medicine
- xi) Sports Animal Medicine
- xii) Drug designing
- xiii) Wildlife medicine

Study Circles

- i) Livestock and Livelihood Study Circle
- ii) Production Systems Study Circle
- iii) Ecosystems and Livestock Study Circle
- iv) Equine Study Circle
- v) Canine Study Circle
- vi) Diagnostic Study Circle
- vii) Alternate Animal Use Study Circle
- viii) Fun/Sport Animal Study Circle
- ix) Law and Veterinary Science Study Circle

Entrepreneurial Training

- (i) Goat Production
- (ii) Sheep Production
- (iii) Pig Production
- (iv) Broiler and Egg Production
- (v) Pet Production
- (vi) Dairy Production
- (vii) Meat Production and Processing
- (ix) Feed Production-Mineral Mixture
- (x) Milk Products
- (xi) Food safety-residue Analysis
- (xii) Clinical Investigatory laboratory
- (xiii) Quality Control-Evaluation Microbial
- (xiv) Shoeing and Shoe Manufacture
- (xv) Production of Diagnostic
- (xvi) Pharmaceutical Formulations
- (xvii) Fish Production

Comprehensive Examination on Core Competence in Veterinary skills:

The competence in veterinary skills examination shall be based on an evaluation of core competence in professional skills as detailed below:

1. Restraint of cow, sheep, horse, dog and pig. Haltering, snaring, muzzling, tad switch, bandaging of horse for exercise and stable bandaging
2. Animal identification, Dentition and ageing of animals
3. Housing layout/requirements of livestock and poultry
4. Computation of ration of livestock of different breeds and age groups in health and disease
5. Fodder management and interpretation of feed quality evaluation
6. Physical evaluation of livestock health parameters (auscultation, percussion, recording of temperature, pulse, heart rate, respiration rate, etc.)

7. Recording and interpretation of cardiovascular response
8. Testing of milk and milk products for quality, clean milk production
9. Carcass quality evaluation (ante-mortem & post-mortem examination)
10. Specific diagnostic tests for zoonotic diseases
11. Sample collection, handling and dispatch of biological materials for laboratory examination
12. Staining techniques for routine clinico- pathological examinations
13. Relating post-mortem lesions to major livestock diseases
14. Haematological evaluation (total leukocyte count, differential leukocyte count, haemoglobin, packed cell volume, erythrocyte sedimentation rate etc.) and interpretation
15. Tests and their interpretation for haemoprotozoan diseases
16. Body fluids collection, examination and interpretation as an aid to diagnosis
17. Urine evaluation procedures and interpretation as indicators for diagnosis of diseases
18. Fecal examination- procedures and interpretation
19. Examination of skin scrapings and interpretation
20. Interpretation of blood chemistry profile in diseases
21. Deworming procedures and doses for different species of animals/birds
22. Managing an outbreak of infectious/contagious disease
23. Approach to diagnosis of a given disease condition
24. Pre-anesthetic administration and induction, maintenance of general anesthesia and dealing with anesthetic emergencies
25. Local anesthetic administration
26. Nerve blocks-sites, functional application
27. Suture material, suture pattern and tying knots
28. Common surgical procedures including dehorning, docking, caesarian section, ovariohysterectomy, castration, rumenotomy
29. Application of plaster cast/splint for fracture immobilization and other bandaging procedure in large and small animals.
30. Soundness in horses

31. Rectal examination - palpation of pelvic/abdominal organs in cattle/ horses/ buffaloes,
32. Detection of oestrus, artificial insemination, pregnancy diagnosis,
33. Management of vaginal/uterine prolapse and dystocia
34. Andrological examination of bull, handling, preservation and evaluation of semen
35. Vaccination procedures, vaccination schedules and vaccine types for different diseases
36. Handling of radiograph, interpretation of a given radiograph of large and small animals
37. Client management
38. Managing a clinical practice, ambulatory van, transporting a sick animal requirement, etc.
39. Dosage regimens of important drugs
40. Drug administration techniques in different species of animals-oral, parenteral, rectal, intra-peritoneal and intra-uterine
41. Identification of major livestock/poultry breeds
42. Measuring climatic parameters and their interpretation
43. Communication technology tools

